IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

ROB A. BEUKER

SERIAL NO.: 09/624,522

FILED: July 24, 2000

MOTION ESTIMATION

Atty. Docket

PHN 17,569

GROUP ART UNIT: 2613

EXAMINER: T.T. Vo

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

RESPONSE UNDER 37 C.F.R. 1.116

This is in response to the Office Action mailed September 24, 2003, in which the Examiner finally rejected claims 1 and 4-7 under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,473,379 to Horne; claims 2 and 3 under 35 U.S.C. 103(a) as being unpatentable over Horne in view of U.S. Patent 6,462,791 to Zhu; and claim 8 under 35 U.S.C. 103(a) as being unpatentable over Horne in view of U.S. Patent 6,385,245 to De Haan et al.

Applicant traverses the above rejections and offers the following explanation.

The Horne patent discloses a method and apparatus for improving motion compensation in digital video coding, in which the global motion vector is used to define a search window for the motion estimator. Within this search window, as defined by the

global motion vector, motion vectors are sought by means of some motion vector estimation process.

In the subject invention, a block-based motion vector estimation process is carried out that involves comparing a plurality of candidate motion vectors to determined block-based motion vectors; a most frequently occurring block based motion vector is determined; a global motion vector estimation process is carried out using at least the most frequency occurring block-based motion vector to obtain a global motion vector; and the global motion vector is applied as a candidate vector to the block-based motion vector estimation process. Applicant submits that these features are clearly set forth in the elements of claim 1.

Applicant further submits that from the above, it should be clear that the global motion vector is included in the plurality of candidate motion vectors to be compared to determine the block-based motion vectors.

It is Applicant's contention that this is neither shown nor suggested by Horne, in which the global motion vector is only used to determine a window.

The Examiner states:

> "... applying the global motion vector as a candidate vector to the block-based motion vector estimation process (330 of fig. 3A; e.g. the step (330) receives the global motion vector from the motion estimator (106 of fig. 1); see also col. 11, lines 47-58)."

Applicant submits that the Examiner is either misreading or misconstruing Horne. While the global motion vector is indeed applied to the block-based motion estimator (104 of Fig. 1), at step 330 of the flowchart of Fig. 3A, and the ensuing step 332 sets the variable GM equal to the global motion vector GMV, Applicant would like to point out that Fig. 3A also shows that step 332 feeds back to step 302 where new data $DB_{i,t}$ is received and from there to step 310 where $A_{ref} = F\{BP_{i,t}, GM\}$, which is described at col. 9, lines 31-38, which states:

> "Next, in step 310, the search window $A_{ref}$ within the reference frame is defined. $A_{ref}$ is video data representing the portion of the reference frame within which a displaced block $MB_{ref}$ for $DB_{i,t}$ may be located. The location of $A_{ref}$ within a the reference frame is defined by first centering $A_{ref}$ on the new block position $BP_{i,t}$, and then displacing $A_{ref}$ by an amount defined by the stored global motion vector GM."

As such, it should be clear that GM is being used to determine the window $A_{ref}$. A further examination of Fig. 3A leads to the fact that GM is not used anywhere else in determining the best (most frequently occurring) block-based motion vector $MV_{i,dt}$. As such, GM, the global motion vector is only used to determine the window $A_{ref}$.

With respect to claim 4, Applicant further contends that there is no disclosure or suggestion in Horne of additionally using the second most frequently occurring motion vector in determining the global motion vector.

In response, the Examiner states:

> "It is submitted that Horne teaches using second most frequently occurring vector to obtain the global vector)(i.e. a second best block-based motion vector (second-most frequently occurring block-based motion vector) is determined by the step (318 of fig. 3A) and then being transmitted to the global motion estimator (106 of fig. 1) by the step of (322); see also col. 11, lines 29-31, 47-56)."

Again, Applicant submits that the Examiner is either misreading or misconstruing Horne. In particular, referring to Fig. 3A, step 316 determines $MB_{ref}$, the best matched block within the window $A_{ref}$. Step 318 establishes the best matched motion vector using the formula $MV_{i,dt} = BP_{i,t}$ - (position of first pel in $MB_{ref}$). (Note that the Examiner admits that $MV_{i,dt}$ is best matched (most frequently occurring) block-based motion vector in the previous paragraph of the Office Action relating to claim 1). Further, the sections of the patent referred to by the Examiner read as follows:

> "In step 322, the motion vector $MV_{i,dt}$ is provided to the global motion estimator";

and

> "In step 328, the processor determines whether there are more new data blocks within the current frame to be compensated. This information may suitably be provided by the control circuitry. If no, the processor retrieves a new global motion vector GMV from the global motion estimator in step 330. The global motion estimator may suitably operate according to the method discussed below in connection with FIG. 4. In step 332, the new global motion vector is stored as GM for use within the motion estimator 104 for processing the next video frame, which in motion compensation prediction would typically be $F_{t+1}$."

Applicant submit that it should be clear from reading these sections that there is no suggestion of determining the second most frequently occurring motion vector, and that in Horne, the only motion vectors "sent" to the global motion estimator 106 are the best matched (most frequently occurring) block-based motion vectors $MV_{i,dt}$. Hence, Horne neither shows nor suggests additionally using the second most frequently occurring motion vector in determining the global motion vector.

The Zhu patent discloses constrained motion estimation and compensation for packet loss resiliency in standard based CODEC which arguably discloses making a selection among block-based motion vectors having a corresponding motion error below a given motion error threshold. However, Applicant submits that Zhu fails to disclose or suggest that which is missing from Horne, i.e., that the global motion vector is used as a candidate vector in a block-based motion vector estimation process (BME) that involves comparing a plurality of candidate vectors (including the global motion vector) to determine a motion vector.

The De Haan et al. patent discloses motion estimation and motion-compensated interpolation which discloses applying the output video from a motion compensation arrangement to a display unit. However, Applicant submits that De Haan et al. fails to disclose or suggest that which is missing from Horne, i.e., that the global motion vector is used as a candidate vector in a block-

based motion vector estimation process (BME) that involves comparing a plurality of candidate vectors (including the global motion vector) to determine a motion vector.

In view of the above, Applicant believes that the subject invention, as claimed, is neither anticipated nor rendered obvious by the prior art, either individually or collectively, and as such, is patentable thereover.

Applicant believes that this application, containing claims 1-8, is now in condition for allowance and such action is respectfully requested.

Respectfully submitted,

by

Edward W. Goodman, Reg. 28,613
Attorney
Tel.: 914-333-9611

#7 11-7-03 P2.

OFFICIAL

TELECOPIER TRANSMISSION
TO THE UNITED STATES PATENT AND TRADEMARK OFFICE

(703) 872-9315

RECEIVED
CENTRAL FAX CENTER
NOV 0 5 2003

please enter PV 11/14/03

TO: EXAMINER Tung T. Vo

EXAMINER'S TELEPHONE NUMBER 703-308-5874

ART UNIT 2613

SERIAL NO. 09/624,522

FROM: Edward W. Goodman

REGISTRATION NO. 28,613

PHILIPS INTELLECTUAL PROPERTY & STANDARDS
P.O. BOX 3001
BRIARCLIFF MANOR, NY 10510-8001
TELEPHONE: 914-333-9611
FACSIMILE: 914-332-0615

Enclosed: R116 Response + Cover

I certify that this document consisting of 8 pages (including this cover sheet) is being transmitted via telecopier to the United States Patent and Trademark Office at the telephone number set forth above on November 5, 2003.

Edward W. Goodman

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

ROB A. BEUKER

Serial No.: 09/624,522

Filed: July 24, 2000

Title: MOTION ESTIMATION

Atty. Docket

PHN 17,569

Group Art Unit: 2613

Examiner: T.T. Vo

Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Enclosed is an amendment in the above-identified application.

[ X ] No additional fee is required.

[ ] The fee has been calculated as shown below.

| CLAIMS AS AMENDED | | | | | | |
|---|---|---|---|---|---|---|
| | Claims remaining after amendment | | Highest number previously paid for | Number extra | Rate | Additional Fee |
| Total Claims | 8 | Minus | 20 [1] = | | X $18 = | $ |
| Independent Claims | 2 | Minus | 3 [2] = | | X $86 = | $ |
| Multiple Dependent Claims, if any. If not previously paid, $290. | | | | | | $ |
| Total Additional fee for this amendment = | | | | | | $ |

[1] If less than 20, enter 20. [2] If less than 3, enter 3.

Please charge any fees which may be required, except the issue fee, or credit any overpayment to Deposit Account No. 14-1270.

Edward W. Goodman, Reg. 28,613
914-333-9611